Design Information – Haskill Creek – Reimer Reach Floodplain Renovation

Introduction

Haskill Basin Watershed Council formed in 2000 with a mission to maintain and enhance the chemical, biological and physical integrity of Haskill Creek by a voluntary and cooperative effort. Agreed upon goals for attaining the purpose of the mission statement include:

a. Complete a detailed watershed assessment as a basis for setting priorities and measuring progress against objectives over time. (done)

b. *Maintain, or where needed, restore the chemical, biological and physical integrity of Haskill Creek by stabilizing stream banks, improving stream habitat and riparian vegetation.*

c. Improve water quality and improve native fish populations.

d. Protect the watershed by developing a comprehensive water quality plan based on objective, scientific input from all stakeholders. (waiting for TMDL model)

e. Create a partnership of stakeholders and other interested parties.

f. Create an awareness of the Haskill Creek watershed and the chemical, biological and physical systems within it, through promotion of land treatments which will result in a change in the habits of the watershed residents that reflect a concern for the watershed's quality.

g. Provide public education, awareness, communication, appreciation, etc., of the watershed.

Haskill Basin Watershed Council (HBWC) has systematically been working to achieve the stated goals. Flathead Conservation District (FCD) has worked closely with HBWC and an FCD staff member acts as its watershed coordinator and fiscal agent. FCD will provide all contract management for the project, including a limited solicitation for subcontracting and submitting all required reports. FCD will also be the agency liaison with the landowners, school, HBWC and other participants.

The Reimer reach was initially identified as a priority reach in the *Haskill Creek Watershed Assessment Final Report, 2003*. The reference reaches were studied at that time.

1. Present Baseline Conditions

Haskill Creek within the project area is a fourth order, perennial stream and is characterized as a low-gradient, entrenched F channel type (see Attachment A: Haskill Creek – Reimer Reach Project Maps). This section of the drainage is formed in a broad valley with gentle, down-valley elevation relief. Dominant land uses include agriculture and residential development. Attachment D shows photos of the typical channel.

The problem areas identified in the report are characterized by the presence of high eroding streambanks and minimal or shallow-rooted grasses as riparian vegetation. The existing vegetation provides little shade that can moderate summer water temperatures or cover to enhance aquatic habitat. An existing conditions survey was completed in the summer of 2010.

The survey included surveying Haskill Creek within the project area using a total station/GPS unit. The survey detailed the existing channel and streambank conditions. Pebble count and Bank Erosion Hazard Index (BEHI) data were also collected to characterize existing site conditions. Eleven cross-sections and two bank profiles were surveyed along with approximately 1,300 ft of discontinuous longitudinal profile. Photo points were established to document pre and post-construction and post runoff conditions. Attachment B contains profile maps and cross sections which characterize channel attributes.

2. Causes of Impairment

This section of Haskill Creek has been subjected to major changes in form and function, resulting primarily from channel relocation, straightening, and vegetation removal that occurred prior to and during the 1920s. Early settlers in the western United States found that the alluvial valleys were very poorly drained, hampering agricultural development. Flooding and high water table problems were addressed by widening, straightening, and/or relocating stream channels, excavating floodplain drains, and constructing dikes to increase channel capacity and prevent over-bank flooding. While these techniques mitigated problems associated with flooding and high water table elevations in the short-term, the long-term implications on river systems, in general, have been significant.

Riparian vegetation clearing, land cover disturbance and physical stream straightening have led to substantial deviations in the stable dimension, pattern, and profile of Haskill Creek within the project area. When stream channels of this type and setting are physically straightened and ditched, the first response of the channel is to downcut. When this process occurs, the resultant channel becomes steeper than the original stream channel. The oversteepened bed profile (or energy grade line) increases the slope, hydraulic radius, and channel depth, which collectively increases the conveyance and shear stress applied to the channel perimeter. Erosion and subsequent deposition of fine grained bank materials fills the interstitial areas of coarse bed materials. Habitat complexity is reduced and water temperatures rise. These changes reduce suitable spawning and rearing habitat. See Attachment B for channel cross sections and profiles.

The City of Whitefish obtains the bulk of its municipal water supply from the headwaters of Haskill Creek. In the spring when water quality decreases due to increased color at the treatment plant, diversion is reduced suddenly. This results in an abrupt increase in flow downstream that is added to any natural snowmelt runoff. Water levels can rise quickly against the dry banks, exacerbating the erosion.

A bioengineered restoration approach similar to what is proposed here was used upstream of the Reimer reach on the Voerman's property. Annual streambank erosion rates in the Voerman project area were estimated using the Bank Assessment for Non-point Source Consequences of Sediment (BANCS) model. Established curves relating BEHI and near-bank stress to predicted annual streambank erosion rates were utilized. The first equation is from Yellowstone National Park, representing streams formed in alpine glaciated valley morphologies and/or volcanism geology (Rosgen 1996, 2001a). A second equation is based on Colorado streams formed in

sedimentary and/or metamorphic geology and was also used to predict annual streambank erosion rates (Rosgen 1996, 2001a) for the project area. The third equation was developed from bank erosion study sites established for the Middle Blackfoot River TMDL (MT DEQ 2007). The table below summarizes the sediment reduction success at the Voerman site.

Table 1. Sediment Load Reduction Estimate using BEHI Analysis –Voermans' Project

	Average Bank Height (ft)	Average Bank Protection (%)	Average BEHI Score	Average BEHI Rating	Average Near Bank Stress	Colorado (tons/yr)	Yellowstone (tons/yr)	Blackfoot (tons/yr)
2004 Existing Conditions	7.8	22.8	50	Extreme	High/ V High	1989	848	206
2007 As-built Conditions	2.1	60	22	Moderate	Moderate/ High	32.8	53.8	27.1
2008 One-year Conditions	2.1	47.2	22.7	Moderate	Moderate/ High	32.4	55.4	28.1
% Change (2004-08)	**-73**	**107**	**-55**	**n/a**	**n/a**	**-98**	**-93**	**-86**

As detailed in Table 1, within the Voerman project area the average BEHI rating decreased from an extreme bank erosion hazard in 2004, to a moderate hazard in 2007 and 2008. Through natural channel design techniques, restoration has reduced sediment delivery to the active channel from 1,989 tons/year in 2004, to 32.8 tons/year in 2007 and 32.4 tons/year in 2008 based on the Colorado equation. This is also evidenced by the coarsening of bed sediment that was measured, shown below in Figure 1. Photo points documented success of vegetation. The increased frequency of pools that was measured, coupled with the installation of habitat structures, indicates an overall improvement in fish habitat. We expect similar results to occur on the Reimer reach.

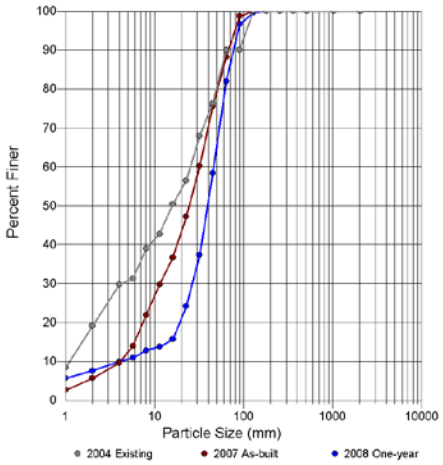

Figure 1. Substrate particle size distribution data for 2004 existing conditions, 2007 as-built and 2008 post runoff conditions for two riffle features on the Voermans reach of Haskill Creek.

Construction of the proposed project would reconnect the stream to its floodplain, create a healthy riparian area, and create bank stabilization and complexity. This would improve water quality, coarsen bed materials, help lower water temperature and increase in-channel complexity which would improve fish habitat.

3. Design Data. Five individual sites have been selected for treatment that will mitigate sediment inputs to Haskill Creek, reestablish connectivity between in-channel and floodplain processes, vegetate the riparian area and floodplain and improve aquatic habitat for fish. Techniques proposed for the five sites involve lowering the high banks to floodplain elevation, and implementing a rigorous riparian and floodplain revegetation plan (see attachment B for design details). Two slightly varying bank treatments will be used in this demonstration project that will provide bank stability and reduce bank and terrace erosion - woody debris jams with toe wood at sites 1, 2, 3, and 5, and hedge-brush layering with conifer fascines at site 4. Attachment C is a description of the general technique to be used at site 4. No instream channel modifications will be constructed. In the *Haskill Creek Target Parameters Summary, Analysis and Recommendations for the Haskill Creek TMDL Planning Area*, 2007, the following creeks were listed as reference reaches: First, Second and Third creeks of Haskill Creek, and Chicken and Chepat creeks of the Stillwater River drainage.

4. Plan View drawing. See Attachment B for all design details for sites 1, 2, 3, and 5. The first two pages are project vicinity maps. The next 5 pages (PP1-5) are project profile maps for each site showing stream profile and pre and post construction channel descriptions. **Design data for sites 3, 4 and 5 are mislabeled as sites 4, 5 and 6.** The next three pages (XS1-3) are channel cross sections showing the proposed floodplain construction.

5. Proposed Structures. Attachment B (DT1 through DT 3) show the details of design. Please note that the illustration of toe wood is not to scale and will not extend out from the bank as much as illustrated in the graphic. Maximum diameter of toe wood is 6". Attachment C is a conceptual sketch of the site 4 treatment. Attachment B also shows the floodplain revegetation plan. It follows the guideline set forth by the Natural Resource Conservation Service (NRCS). The rock originally proposed for the project has been deleted.

6. Land Use

Current land use at the site is agricultural with some residences. The riparian area and floodplain benches will remain as a buffer to the agricultural land at the top of the terrace. As part of the DEQ requirements, FCD will prepare a riparian management plan (RMP) for the Reimer project area which will be signed by one of the landowners. This landowner agreement (LA) will guarantee adherence to the final RMP plan. The Landowner Agreement will provide conditions under which agencies may access the project area for performing inspections and effectiveness monitoring.

The Riparian Management Plan for the project area will address, at a minimum: 1) timeframe for the plan that includes a general schedule for monitoring; 2) goals defining the desired condition for the project area; 3) measurable restoration objectives for riparian vegetation

cover and percentage of banks with active erosion; 4) any limitations on agricultural activities, including livestock grazing, within the project area; 5) weed control requirements; 6) photographic monitoring of vegetation at permanent photo points; 7) process for performing maintenance or repair in the project area; 8) removal and disposal of weed mats and browse protector materials when no longer needed.

The RMP will assure successful establishment and stewardship of a healthy buffer for agricultural land.

7. Collaborative Effort

This project is designed to be a collaborative effort of federal, state, local and private funding coupled with an outreach component. DNRC started the project off with a $10,000 grant for an engineered design, initial survey work and permitting. River Design Group donated cost overruns as in-kind. DEQ invested $30,000 in the project, with $3,000 of that marked to go to FCD for administration and reducing the project money to $27,000. FCD will turn that money back into the project. The landowners are donating much of the construction labor and use of heavy equipment through their business, Midway Rental.

There is a strong education component to the project as well. Whitefish High School students will participate in gathering willow cuttings and replanting the floodplain. A Montana Conservation Corps crew will be brought in to work with the students and finish up the tasks. Funding for the crew was not in the original request because it was thought the Whitefish High School students and other volunteers could accomplish the work. The addition of the second design doubled the number of willow cuttings necessary and added the construction of conifer fascines. Coupled with other additional expenses the technique required proved that volunteers would be unable to complete the vegetation portion of the project without help. The presence of the MCC crew will enhance the service learning and applied science opportunities for the students, as well as help build community. The landowner is also involved with the Boy Scouts of America, and FCD is working to get BSA involved in the project as well.

8. Budget

FCD is requesting $10, 909.54 from the Future Fisheries Improvement Program to round out the funding necessary to complete all 5 sites in the project (see Attachment B. Budget and Proof of Funding). Documentation of the completed design work funded by DNRC is attached. The scope of work for the DEQ contract is included to verify the dollar amount received. Minutes from the FCD board meeting showing the motion to use the administrative fees for the project are also attached. FCD works closely with all agencies and organizations to promote and carry out conservation projects in the valley.

9. Letters of Support

Attachment F contains a list of support letters received for the DEQ grant. Copies of those letters are attached. The budget in the DEQ grant did not include money specifically for monitoring fish habitat improvements, so FCD was prohibited from including mention of improvements to water temperature and fish habitat. That is why there is little mention of

improvement to fisheries, despite the strong connection between the proposal and expected improvements in fisheries and fishing potential.

10. List of Attachments

- Attachment A. Project Maps (2 pages)
- Attachment B. Design Information (14 pages)
- Attachment C. Conceptual Design for site 4. (1 page)
- Attachment D. Project Area Photos for Haskill Creek (2 pages)
- Attachment E. Budget and Proof of Funding (7 pages)
- Attachment F. Letters of Support (7 pages)